CAN BUS Analyzer User's Guide

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CAN BUS ANALYZER USER'S GUIDE

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CAN BUS ANALYZER USER'S GUIDE

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the Chapter Name. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the Chapter Name as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Introduction"**
- **Chapter 2. "Installation"**
- **Chapter 3. "Using the PC GUI"**
- **Appendix A. "Error Messages"**

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

RECOMMENDED READING

This user's guide describes how to use the CAN Bus Analyzer on a CAN network. The following Microchip documents are available on www.microchip.com and are recommended as supplemental reference resources to understand CAN (Controller Area Network) more thoroughly.

AN713, Controller Area Network (CAN) Basics

This application note describes the basics and key features of the CAN protocol.

AN228, A CAN Physical Layer Discussion

AN754, Understanding Microchip's CAN Module Bit Timing

These application notes discuss the MCP2551 CAN transceiver and how it fits within the ISO-11898 specification. ISO-11898 specifies the physical layer to ensure compatibility between CAN transceivers.

CAN Design Center

Visit the CAN design center on Microchip's web site (www.microchip.com/CAN) for information on the latest product information and new application notes.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools. These include the MPLAB C18 and MPLAB C30 C compilers; MPASM™ and MPLAB ASM30 assemblers; MPLINK™ and MPLAB LINK30 object linkers; and MPLIB™ and MPLAB LIB30 object librarians.
- **Emulators** – The latest information on Microchip in-circuit emulators. This includes the MPLAB ICE 2000 and MPLAB ICE 4000.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 2.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB SIM simulator, MPLAB IDE Project Manager and general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include the MPLAB PM3 and PRO MATE II device programmers and the PICSTART® Plus and PICkit™ 1 development programmers.

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CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com

DOCUMENT REVISION HISTORY

Revision A (July 2009)

- Initial Release of this Document.

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Chapter 1. Introduction

1.1 INTRODUCTION

The CAN BUS Analyzer Tool is intended to be a simple-to-use, low-cost CAN Bus monitor which can be used to develop and debug a high-speed CAN network. The tool features a broad range of functions which allow it to be used across various market segments including automotive, marine, industrial and medical.

The CAN Analyzer tool supports CAN 2.0b and ISO 11898-2 (high-speed CAN with transmission rates of up to 1 Mbit/s). The tool can be connected to the CAN network using the DB9 connector or through a screw terminal interface.

The CAN BUS Analyzer has the standard functionality expected in an industry tool such as trace, transmit, trace filter and log file capability, and it also integrates some unique features such as ECAN register view and group CAN message transmit. All of these features make it a very versatile tool, allowing fast and simple debugging in any high-speed CAN network.

The chapter contains the following information:

- CAN BUS Analyzer Kit Contents
- Overview of CAN BUS Analyzer
- CAN BUS Analyzer Hardware Features
- CAN BUS Analyzer Software

1.2 CAN BUS ANALYZER KIT CONTENTS

1. CAN BUS Analyzer Hardware
2. CAN BUS Analyzer Software

- The CAN BUS Analyzer software CD includes three components:
  - Firmware for the PIC18F2550 (Hex File)
  - Firmware for the PIC18F2680 (Hex File)
  - The CAN BUS Analyzer PC GUI

3. USB mini cable to connect the CAN BUS Analyzer to the PC

1.3 OVERVIEW OF THE CAN BUS ANALYZER

The CAN BUS Analyzer provides similar features available in a high-end CAN network analyzer tool at a fraction of the cost. The CAN BUS Analyzer tool can be used to monitor and debug a CAN network with an easy-to-use graphical user interface. The tool allows the user to view and log received and transmitted messages from the CAN BUS. The user is also able to transmit single or multiple CAN messages onto a CAN BUS, which is useful during development or testing of a CAN network.

Using this CAN BUS Analyzer tool has many advantages over the traditional debugging methods embedded engineers typically rely on. For example, the tool trace window will show the user the received and transmitting CAN messages in an easy to read format (ID, DLC, data bytes and timestamp), which, in traditionally debugging, the user would have to convert the register hexadecimal values of a received ID into usable form.

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1.4 CAN BUS ANALYZER HARDWARE FEATURES

The CAN BUS Analyzer hardware is a small compact tool that includes the following hardware features. Refer to **Section 1.5 "CAN BUS Analyzer Software"** for more information about the software features.

FIGURE 1-1: CAN BUS ANALYZER

- Mini USB Connector

  This connector provides the CAN BUS Analyzer a communication medium to the PC, but it can also provide a power supply if the external power supply is not plugged into the CAN BUS Analyzer.

- 9-24 Volt power supply connector

  When powered by the external power supply, the tool can disconnected from the PC to act as a periodic transmitter for CAN BUS messages.

- DB9 connector for the CAN BUS
- Termination Resistor (Software controllable)

  The user can turn ON or OFF the 120 ohm CAN bus termination through the PC GUI.

- Status LEDs

  Displays the USB status.

- Trigger LED

  Future functionality.

- CAN Traffic LEDs

  Shows the actual RX CAN BUS traffic from thee high speed transceiver.

  Shows the actual TX CAB BUS traffic from the high speed transceiver.

- CAN BUS Error

  Shows the Error Active, Error Passive, Bus Off state of the CAN BUS Analyzer

- Direct access to the CAN H and CAN L pin through a screw terminal

  Allows the user access to the CAN bus for connecting an oscilloscope, without having to modify the CAN BUS wire harness.

- Direct access to the CAN TX and CAN RX pins through a screw terminal

  Allows the user access to the Digital side of the CAN BUS transceiver.

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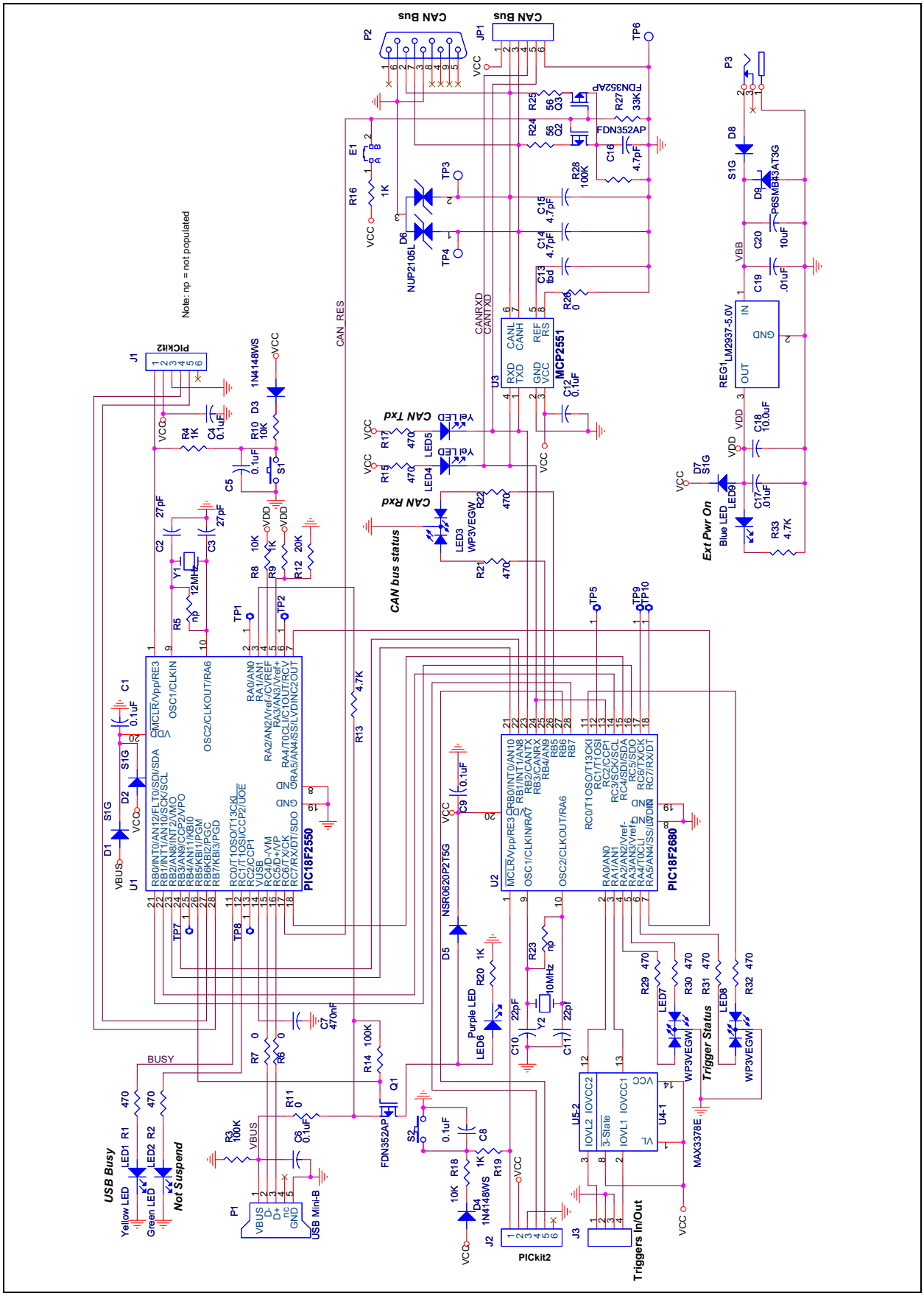
FIGURE 1-2: CAN BUS ANALYZER SCHEMATIC



1.5 CAN BUS ANALYZER SOFTWARE

The CAN BUS Analyzer comes with two firmware hex files and PC software which provides the user with a graphical interface to configure the tool and analyze a CAN network. It has the following software tool features:

1. Trace: Monitor the CAN bus traffic.
2. Transmit: Transmit single shot, periodic, or periodic messages with a limited repeat onto the CAN bus.
3. Group Transmit: Transmit a list of CAN messages, in order, onto the CAN bus.
4. Register View: Read or write the PIC18F2680 ECAN™ registers directly from the CAN BUS Analyzer.
5. Trace Filter Setup: Configure which CAN messages from the CAN bus traffic are visible on the Trace Window.
6. Log File Setup: Save CAN bus traffic.
7. Hardware Setup: Configure the CAN BUS Analyzer for the CAN network and provides functionality to debug the tool.

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Chapter 2. Installation

2.1 INTRODUCTION

The following chapter describes the procedures for installing the CAN Analyzer hardware and software.

The chapter contains the following information:

- Installing CAN BUS Analyzer Hardware
- Installing CAN BUS Analyzer Software

2.2 SOFTWARE INSTALLATION

2.2.1 Installing the GUI

Install .NET framework version 3.5 before installing the CAN BUS Analyzer.

1. Run "CANAnalyzer_verXYZ.exe". By default this will install the files to: C:\Program Files\Microchip Technology Inc\CANAnalyzer_verXYZ
2. Run the setup.exe from folder: C:\Program Files\Microchip Technology Inc\CANAnalyzer_verXYZ\GUI
3. The setup will create shortcut in the Programs Menu under "Microchip Technology Inc" as Microchip CAN Tool ver XYZ.
4. If the CAN BUS Analyzer PC software is being upgraded to a newer version, the firmware should be updated to match the revision level of the PC software. When updating the firmware, ensure that the hex files are programmed into their respective PIC18F microcontrollers on the CAN BUS Analyzer hardware.

2.2.2 Upgrading the Firmware

If upgrading the firmware in the CAN BUS Analyzer, the user will need to import the HEX files into MBLAB IDE and program the PIC® MCUs. When programming the PIC18F2680, the user may power the CAN BUS Analyzer by external power supply or by the mini USB cable. When programming the PIC18F550, the user needs to power the CAN BUS Analyzer by external power supply. Additionally, when programming the HEX files into PIC MCUs, it is recommended to check the firmware version from the GUI. This can be done by clicking on the "Help > About" menu option.

2.3 HARDWARE INSTALLATION

2.3.1 System Requirements

- Windows® XP
- .NET framework version 3.5
- USB Serial Port

2.3.2 Power Requirements

- Power Supply (9 to 24 Volt)
- The CAN BUS Analyzer tool can also be powered using the USB port

2.3.3 Cable Requirements

- Mini USB cable – For communicating with the PC Software
- The CAN Analyzer tool can be connected to a CAN network using the following:
  - Via DB9 connector
  - Via screw-in terminals

2.3.4 Connecting the CAN BUS Analyzer to the PC and CAN BUS

1. Connect the CAN Analyzer via the USB connector to the PC. You will be prompted to install the USB drivers for the tool. The drivers can be found in this location:
   C:\Program Files\Microchip Technology Inc\CANAnalyzer_verXYZ
2. Connect the tool to the CAN network using the DB9 connector or the screw in terminals. Please refer to Figure 2-1 and Figure 2-2 for the DB9 connector and the screw terminals for connecting the network to the tool.:

TABLE 2-1: 9-PIN (MALE) D-SUB CAN BUS PINOUT

Pin Number	Signal Name	Signal Description
1	No Connect	N/A
2	CAN_L	Dominant Low
3	GND	Ground
4	No Connect	N/A
5	No Connect	N/A
6	GND	Ground
7	CAN_H	Dominant High
8	No Connect	N/A
9	No Connect	N/A

FIGURE 2-1: PINOUT FOR THE DB9 CONNECTOR

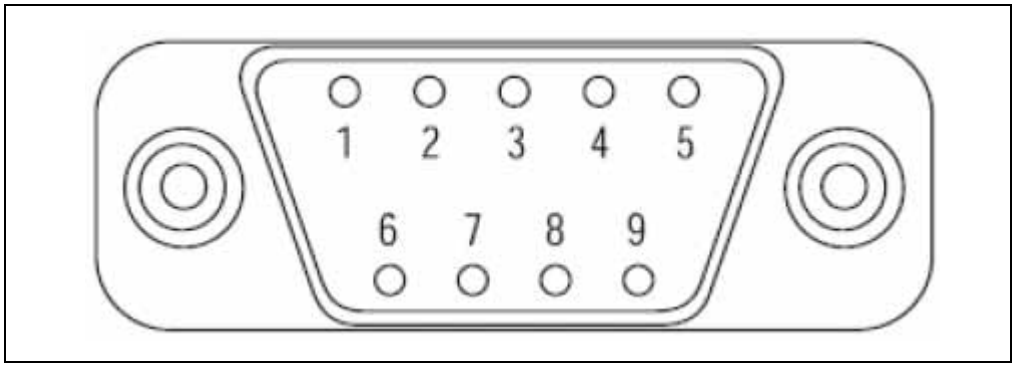

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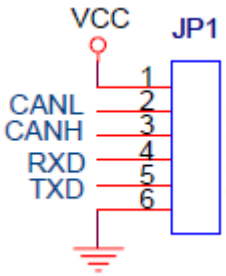
TABLE 2-2: 6-PIN SCREW CONNECTOR PINOUT

Pin Number	Signal Names	Signal Description
1	Vcc	PIC® MCU Power Supply
2	CAN_L	Dominant Low
3	CAN_H	Dominant High
4	RXD	CAN Digital Signal from Transceiver
5	TXD	CAN Digital Signal from PIC18F2680
6	GND	Ground

FIGURE 2-2: PINOUT FOR THE SCREW-IN TERMINALS



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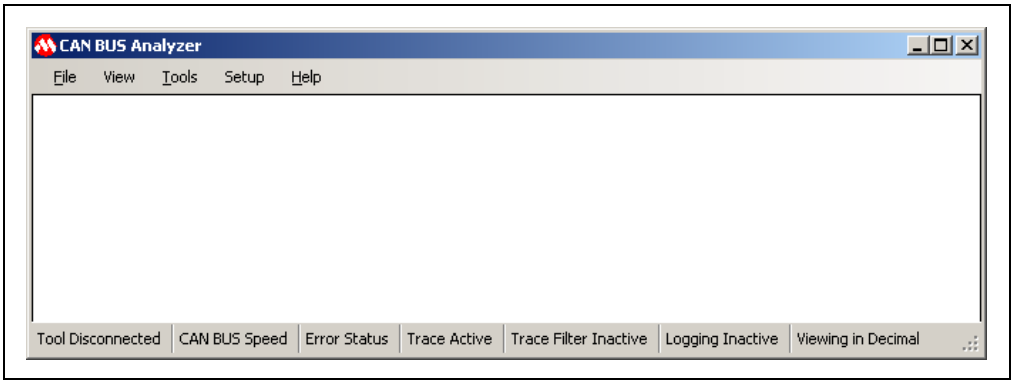
Chapter 3. Using the PC GUI

Once the hardware is connected and the software is installed open the PC GUI using the shortcut in the Programs Menu under "Microchip Technology Inc" labeled as Microchip CAN Tool ver XYZ. Figure 3-1 is a screen shot of the default view for the CAN BUS Analyzer.

FIGURE 3-1: CAN BUS ANALYZER DEFAULT VIEW



3.1 GETTING STARTED WITH A QUICK SETUP

The following are setup steps to quickly start transmitting and receiving on the CAN BUS. For more details, refer to the individual sections for the different PC GUI features.

1. Connect the CAN BUS Analyzer to the PC with the mini USB cable
2. Open the CAN BUS Analyzer PC GUI
3. Open the Hardware Setup and select the CAN BUS bitrate on the CAN BUS
4. Connect the CAN BUS Analyzer to the CAN BUS
5. Open the Trace window
6. Open the Transmit Window

3.2 TRACE FEATURE

There are two types of Trace windows: Fixed and Rolling. To activate either Trace window, select the option from the main Tools menu.

FIGURE 3-2: FIXED TRACE WINDOW

FIGURE 3-3: ROLLING TRACE WINDOW

The Trace window displays the CAN BUS traffic in a readable form. This window will list the ID (Extended or Standard), DLC, DATA Bytes, the Time stamp and the time difference from the last CAN BUS message on the BUS. The Rolling Trace window will show the CAN messages sequentially as they appear on the CAN BUS. The time delta between messages will be based on the last received message regardless of CAN ID.

The Fixed Trace window will show the CAN messages in a fixed position on the trace window. The message will still be updated, but the time delta between messages will be based on the previous message with same CAN ID.

The Trace window can also be configured with filters to show only certain IDs. This can be configured in the Trace Filter Setup (refer to **Section 3.6 "Trace Filter Setup Feature"**).

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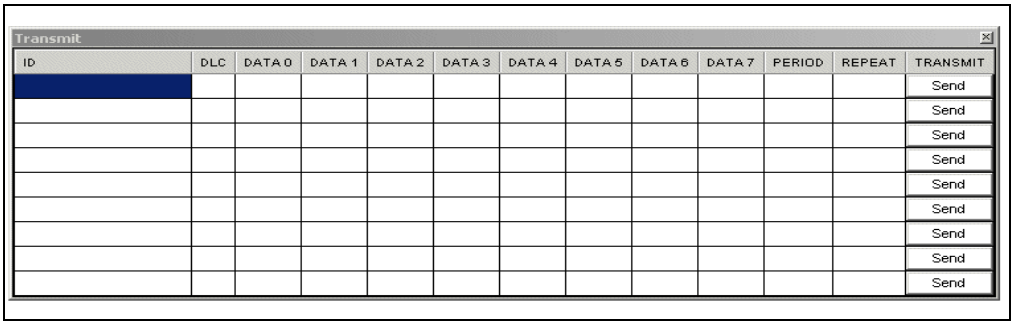
3.3 TRANSMIT FEATURE

To activate the Transmit window, select “TRANSMIT” from the main Tools menu.

FIGURE 3-4: TRANSMIT WINDOW



The Transmit window allows the user to interact with other nodes on the CAN BUS by transmitting messages. The user is able to enter any ID (Extended or Standard), DLC or DATA Bytes combination for single message transmittal. The transmit window also allows the user to transmit a maximum of nine separate and unique messages either periodically or periodically with a limited “repeat” mode. When using the limited repeat mode, the message will be sent out at the periodic rate for a number of “repeat” times.

3.3.1 Steps to Transmit a Single-Shot Message

1. Populate the CAN message fields, which include the ID, DLC and DATA
2. Populate the Periodic and Repeat fields with “0”
3. Click on the **Send** button for that row

3.3.2 Steps to Transmit a Periodic Message

1. Populate the CAN message fields, which include the ID, DLC and DATA
2. Populate the Periodic field (50 ms to 5000 ms)
3. Populate the Repeat field with “0” (which translates to “repeat forever”)
4. Click on the **Send** button for that row

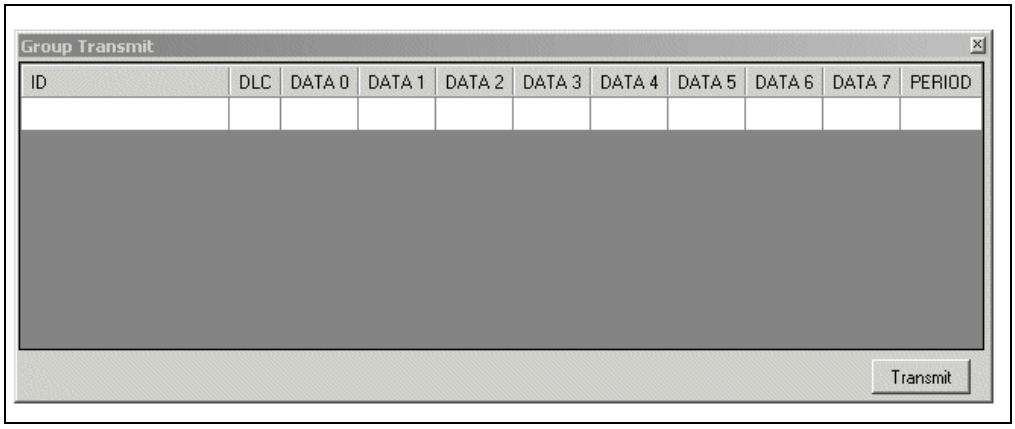
3.3.3 Steps to Transmit a Periodic Message with Limited Repeats

1. Populate the CAN message fields, which include the ID, DLC and DATA
2. Populate the Periodic field (50 ms to 5000 ms)
3. Populate the Repeat field (with a value from 1 to 10)
4. Click on the **Send** button for that row

3.4 GROUP TRANSMIT FEATURE

To activate the Group Transmit window select "GROUP TRANSMIT" from the main Tools menu.

FIGURE 3-5: GROUP TRANSMIT WINDOW



The Group Transmit window allows the user to interact with other nodes on the CAN BUS by transmitting messages. The user is able to transmit a limited group of messages in sequential order spaced out by user-defined timing in the Period field. All messages can be unique to each other in terms of ID, DLC, Data bytes and time between messages.

3.4.1 Steps to Transmit a Group of CAN Messages

1. Fill in the CAN message fields which include the ID, DLC and DATA for all messages that will be transmitted
2. Ensure that the Periodic field is populated for each message (50 ms to 5000 ms). This field represents the time between messages
3. Click on the **Send** button for that row. The row will be highlighted for the current transmitted message

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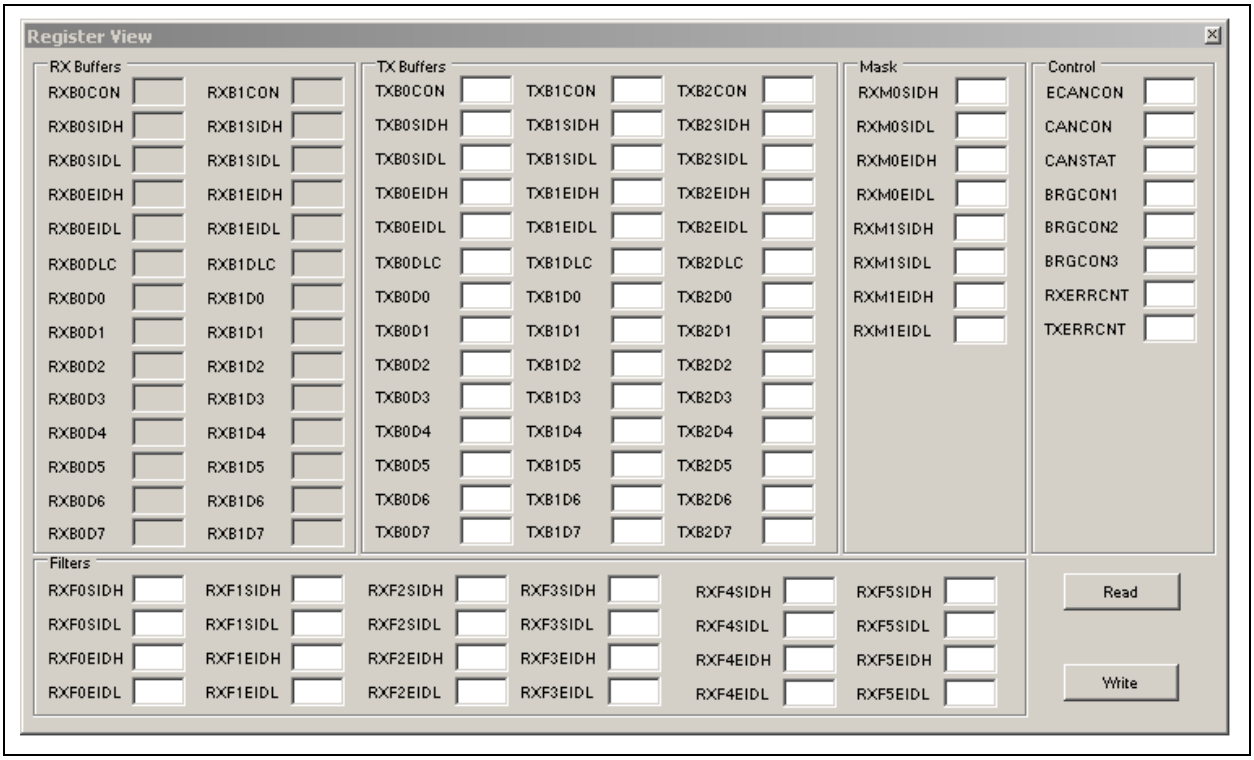
3.5 REGISTER VIEW FEATURE

To activate the Register View window, select “REGISTER VIEW” from the main Tools menu.

FIGURE 3-6: REGISTER VIEW WINDOW



The Register View window allows the user to further examine the ECAN module registers. For example, a user could check which TX buffer is still pending a transmission. After reading the registers, the user will be able to tell which TX buffer is pending by decoding the TXCON registers for each buffer

To read registers, click on the **Read** button. The CAN BUS Analyzer will populate the window with all of the registers with the data from the ECAN module.

Steps to Write Registers

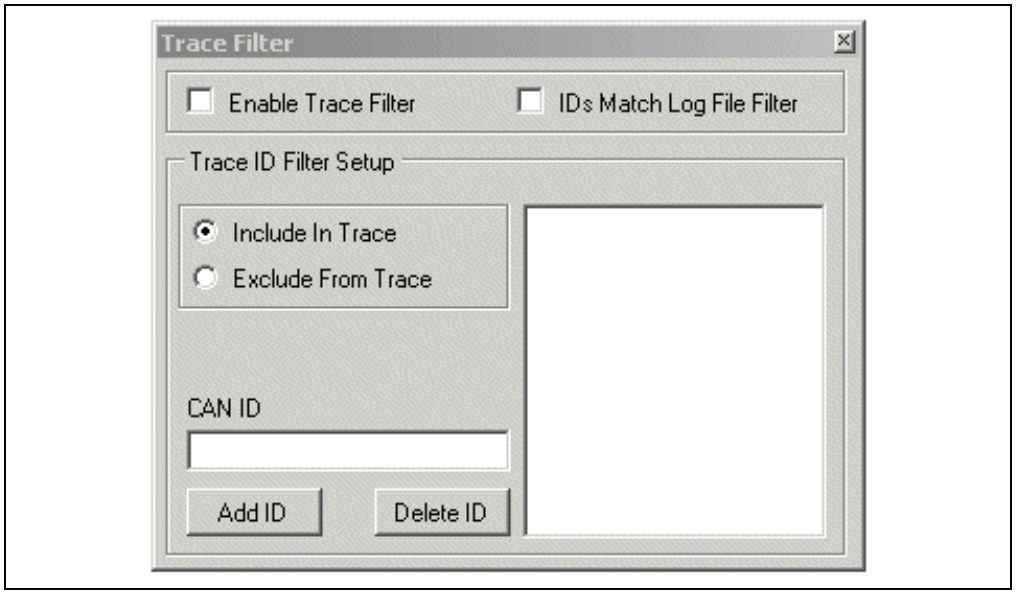
1. Edit a text field with the desired register value (when a field has been edited, it will highlight yellow)
2. Click on the Write button. The CAN BUS Analyzer will then write the modified values to the ECAN module in the PIC18F2680. All fields that were written in the PIC18F2680 will turn grey
3. Perform a Read to get the latest values of all registers (this will clear all grey or yellow cells)

Warning: Writing to the ECAN registers could have unintended effects on the CAN BUS and could change the CAN BUS Analyzer settings.

3.6 TRACE FILTER SETUP FEATURE

To activate the Trace Filter Setup window, select "TRACE FILTER SETUP" from the main Tools menu.

FIGURE 3-7: TRACE FILTER SETUP WINDOW



The Trace Filter Setup window allows the user to filter the Trace window for only the required IDs the user wants to view. The trace filter can match the log file filter or it can contain a completely different set of IDs.

Steps to setup the trace filter to match the log file filter

1. Make sure the Log File Filter is "Turned On"
2. Click on the "IDs Match Log File Filter" checkbox. The Trace ID Filter Setup options will become disabled
3. Click on the "Enable Trace Filter" checkbox to enable the filter
4. Confirm on the Trace window that the status of the trace filter changes from "Trace Filter Inactive" to "Trace Filter Active" (highlighted green)

Steps to setup the trace filter to be independent of the log file filter

1. Determine if the filter will work as an include or an exclude filter
2. Enter CAN IDs into the CAN ID text field and click on the "Add ID" button. Repeat this process until all CAN IDs for the filter are entered
3. Click on the "Enable Trace Filter" checkbox to enable the filter
4. Confirm on the Trace window that the status of the trace filter changes from "Trace Filter Inactive" to "Trace Filter Active (highlighted green)

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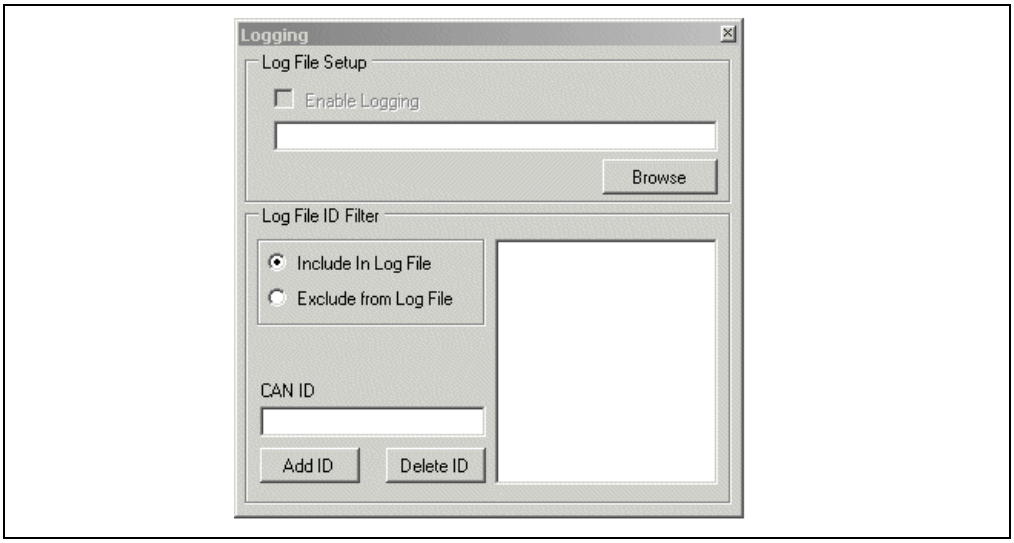
3.7 LOG FILE SETUP FEATURE

To activate the Log File Setup window select “LOG FILE SETUP” from the main Tools menu.

FIGURE 3-8: LOG FILE SETUP WINDOW



The Log File Setup window allows the user to setup a log file of the CAN BUS traffic. This feature helps gather more information when debugging design issues, by capturing the BUS traffic when an event occurs.

Log File Setup also allows the user to setup a filter to either include or exclude user-defined IDs.

Steps to setup a log file

1. Browse to a folder to which you want to save your log file
2. Click on the “Enable Logging” checkbox to enable writing

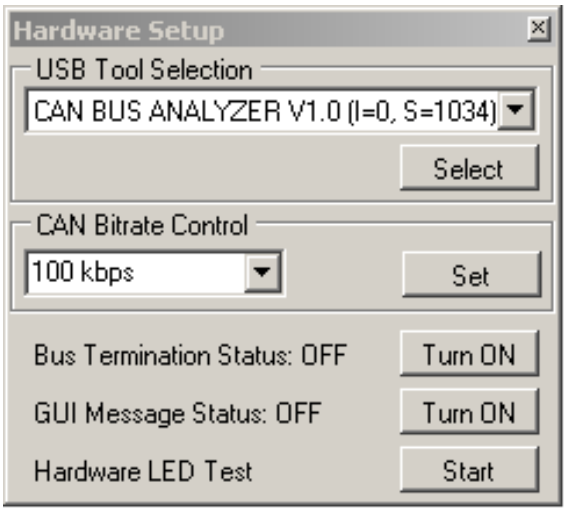
Steps to setup a log file with a filter

1. Determine if the log file filter should work as an include or an exclude filter
2. Enter CAN IDs into the CAN ID text field and click on the “Add ID” button. Repeat this process until all of the CAN IDs for the filter are entered
3. Browse to a folder to which you want to save your log file
4. Click on the “Enable Logging” checkbox to enable writing
5. Confirm on the Trace window that the status of the trace filter changes from “Logging Inactive” to “Logging Active” (highlighted green)

3.8 HARDWARE SETUP FEATURE

To activate the Hardware Setup window, select "HARDWARE SETUP" from the main Tools menu.

FIGURE 3-9: HARDWARE SETUP WINDOW



The HARDWARE SETUP window allows the user setup the CAN BUS Analyzer for communication on the CAN BUS. This feature also gives the user the ability to quickly test the hardware on the CAN BUS Analyzer.

Setup Tool to communicate on the CAN BUS

1. Select the CAN bitrate from the drop down combo box
2. Click the "Set" button. Confirm bitrate has changed by viewing the bitrate setting on the bottom of the main CAN BUS Analyzer window
3. If the CAN BUS needs the termination resistor active, then turn it ON by clicking the "Turn On" button for the Bus Termination

Test the CAN BUS analyzer hardware

1. Ensure that the CAN BUS analyzer is connected. You can confirm this by viewing the tool connection status on the status strip on the bottom of the main CAN BUS Analyzer window
2. To confirm that the LEDs and the communication is working between the USB PIC MCU and the CAN PIC MCU, click on the hardware LED test "Start" button. Note that the software controlled LEDs will walk through a sequence of turning OFF and ON
3. Turn "OFF" or "ON" all internal PC GUI error messages by clicking on the button in the Internal Message Control

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3.9 SAVING AND RETRIEVING THE TOOL CONFIGURATIONS

3.9.1 Saving Tool Configurations

The CAN BUS Analyzer tool allows the user to save various configurations setup by the user in a particular session. The GUI will save the tool setup, the message transmissions and the screen positions and sizes of the various windows of the tool.

By choosing “Save Configuration” under the File menu, the file is saved in a default Temp folder under the default name “config.ini”.

By choosing “Save As” under the file menu, the user can define the path and name for the configuration file.

3.9.2 Retrieving Tool Configurations

Under the File menu, select “Open Configuration” and then select the desired “.ini” file to retrieve the configuration saved by the user.

NOTES:

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Appendix A. Error Messages

In this section, the various "pop-up" errors that are found in the GUI will be discussed in detail as to why they may occur, and the possible solutions for correcting the errors.

Note: To turn off all internal error reporting in the GUI, please refer to **Section 3.8 "Hardware Setup Feature"**.

TABLE A-1: ERROR MESSAGES

Error	Possible Solution
ERROR 1.00 Trouble reading the USB firmware version	Make sure the tool is plugged into the PC, and is programmed with the proper HEX file.
ERROR 2.00 Trouble reading the CAN firmware version	Make sure the tool is plugged into the PC, and is programmed with the proper HEX file.
Error 2.10 All CAN Transmit buffers are full	All CAN TX Buffers are full, so it is possible that there is only one node on the CAN BUS. Make sure the CAN BUS Analyzer is connected to the CAN BUS and that there is at least another active functioning CAN node on the bus.
ERROR 2.15 Internal Bitrate Setting Error	Make sure the firmware versions match the PC GUI.
ERROR 2.20 CAN LED Error	Make sure the firmware versions match the PC GUI.
Error 2.25 Too many SPI messages for CAN Part	Make sure the CAN BUS Analyzer is connected to the CAN BUS.
ERROR 3.00 CAN or USB Firmware levels do not match the PC GUI reversion level	Make sure the firmware versions match the PC GUI.
ERROR 3.10 Enter a valid ID	Make sure the format for a valid ID is correct. Standard 0-2048 in Decimal (0-7FF in Hexidecimal). Extended 0x-536870911x in Decimal (0x-1FFFFFFFx in Hexidecimal).
ERROR 3.15 Enter valid Data. If the CAN BUS analyzer is setup for decimal then enter a value between 0-255 else if the CAN BUS analyzer is setup for hexadecimal then enter a value 0-FF	Make sure the format for valid data is correct.
ERROR 3.20 Enter a valid DLC, 0-8	Make sure the format for valid DLC is correct.
ERROR 3.25 Enter a valid Period, 50-5000, in milliseconds or enter 0 for a one shot CAN message	Make sure the entered period is in range.
ERROR 3.30 enter a valid repeat value, 1-10, or enter 0 for a one shot CAN message	Make sure the entered repeat value is in range.

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